3M Company's Polyurea Traffic Marking (LPM 1200 and 1201)

Final Report

Experimental Feature X(02)13 – New Products

By: Michelle Page, P. E., Program Manager
Barry Sharp, Research Specialist
Robert Stewart, P.E.
Ken Berg, P.E.

Utah Department of Transportation
Research Division

November 2006

Introduction

This report describes the installation and evaluation of 3M Company's 1200 Polyurea traffic marking. Utah Department of Transportation allowed 3M Company to install this product on Bangerter Highway from SR 201 to 3500 South, all lane marking.

Background

Durability, retro-reflectivity and curing time of fluid pavement markings present a continuous challenge for engineers and safety managers. The Utah Department of Transportation (UDOT) is proactively involved in the development and implementation of a pavement marking management program that will ensure acceptable pavement marking performance on State highways. New products are continually being developed which have the potential to improve that program. A particularly promising new product is a polyurea paint striping material produced by 3M Company, LPM 1200. UDOT currently has no polyurea lane line striping on its state highway system.

3M's LPM 1200 polyurea striping material claims several potential advantages over traditional epoxy and water-based paint products. Among them are:

- The polyurea binder material cures to a hardness that enhances the ability of the material to retain the reflective beads, a common problem with traditional paints
- The curing time is only 3 to 6 minutes, depending on the thickness of application (compared to an hour or more with epoxy and water-based paint)
- Polyurea cures to a hardness that enhances durability over epoxy and water-based paints
- Polyurea can be applied at surface temperatures as low as 40 degrees (compared to 50 degrees or more for the other)
- Polyurea has increased visibility in wet night conditions
- Polyurea is more resistant to UV degradation.

If these claims are valid, polyurea would become a valuable tool to UDOT, for the reasons listed above, to be used in conjunction with existing methods of marking lane lines. UDOT Traffic & Safety is championing and funding this Experimental Feature. UDOT Region Two Operations has accepted hosting this Experimental Feature.

Project Responsibilities

Responsibilities on the project are as follows:

UDOT Traffic & Safety Division
- Research Champion
- Construction Manager
- Source of Funding
- Assisting with the product evaluation
- Assisting with preparation of recommendations for future applications
- Implementation

UDOT Research Division
- Preparing the work plan
- Administering the contract
- Identifying performance measures
- Technology evaluation
- Recommendations for future applications
- Implementation

UDOT Region Two Operations
- Project site selection
- Assisting with the product evaluation
- Assisting with preparation of recommendations for future applications
- Implementation

Construction Information

UDOT Region Two Operations selected the segment of SR 154, Bangerter Highway, between SR 201 and 3500 South (NB & SB) to use as the test section for this project. This section of Bangerter Highway experiences a high traffic volume and will provide an effective test of durability. The section is in need of pavement marking replacement. All of the existing lines have been removed per UDOT Standard Specification 02765 and replaced with 3M LPM 1200 polyurea product described earlier.

There are three different applications of this product on this project. The three applications are 4” yellow solid lines, 4” white solid lines and 4” white skip lines, two each direction. Research will take retro-reflectivity measurements at 21 random locations along the test section.

The results of this reflective testing will be compiled every 6 months and an electronic copy will be distributed to interested parties and will be updated on the UDOT Research web-page. UDOT will publish interim reports and a final report when UDOT Traffic & Safety determines to end this study.

Pavement markings are very dependent upon proper preparation and installation. 3M recommended the contractor they use in this area to do the installation:

United Rentals
4533 Andrews Street
North Las Vegas, Nevada 89301.

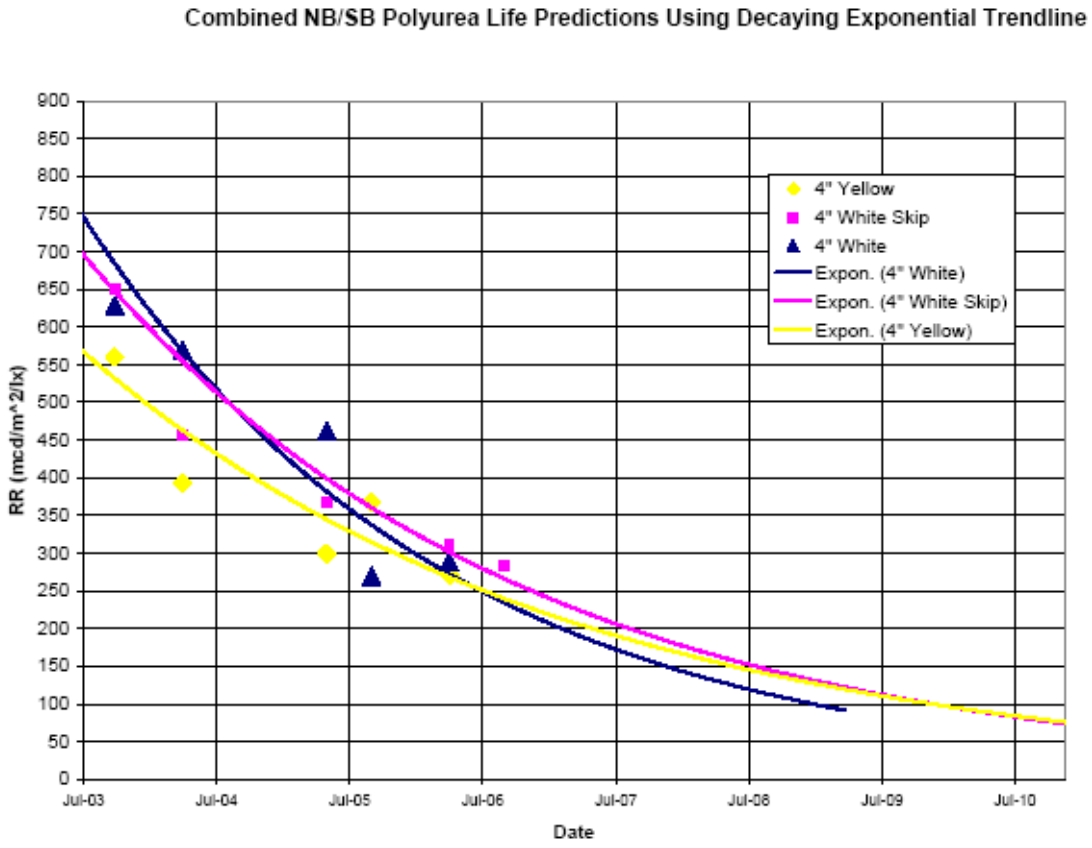
Total cost of this installation was $76,000 which includes removal, preparation and installation.

Objectives

Measure the retro-reflectivity for 3 years
Predict time to failure (100 mcd/sqm/lux) using decaying exponential trendline
Measure durability

Final Results

Product has been evaluated and the projected life is shown in the following graph.



As shown in the preceeding graph, based on a decaying exponential model, the life of the white shoulder line is estimated to be approximately 5.5 years and the

lives of the yellow shoulder line and the white skip lines are estimated to be 6.5 years. These predictions are based on retroreflectivity only.

Conclusions

The material has shown very good durability and as shown in the above graphs it is doing very well on the Bangerter Highway. There is little evidence of bead loss. The average cost per linear foot for this product is under $ 2.00. The life expectancy based on the above model is predicted to be an average of approximately 6 years.

Recommendations

This product has performed well on concrete and should be considered for use as a durable marking on concrete pavement. This product has not been evaluated on asphalt in Utah and further testing is recommended.